1/13

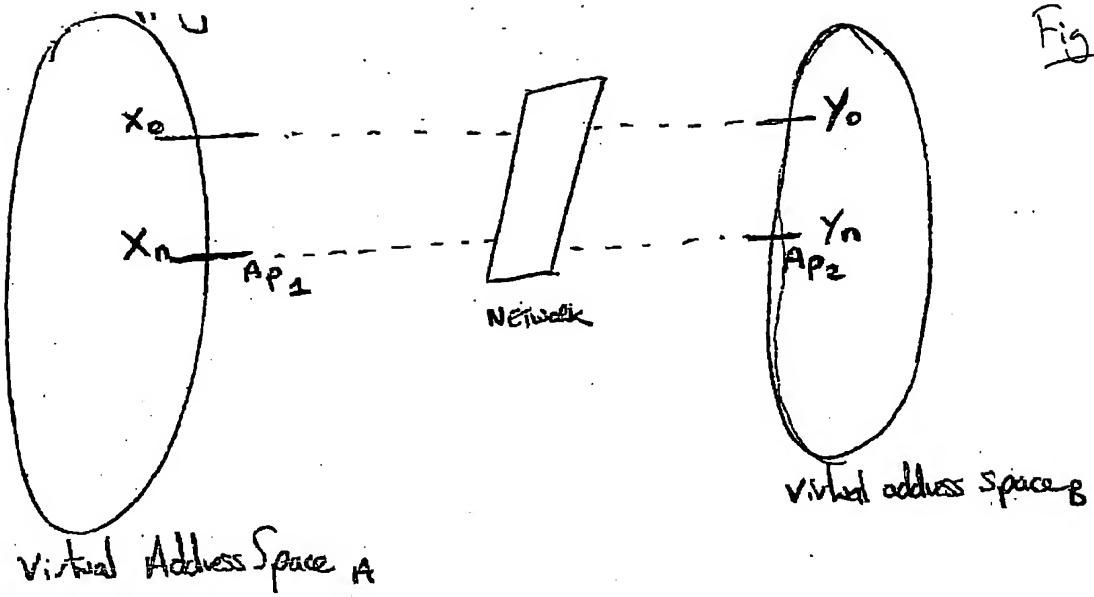
X_0
X_n
AP_1
Network
Y_0
Y_n
AP_2
Virtual Address Space A
Virtual address Space B

Fig. 1

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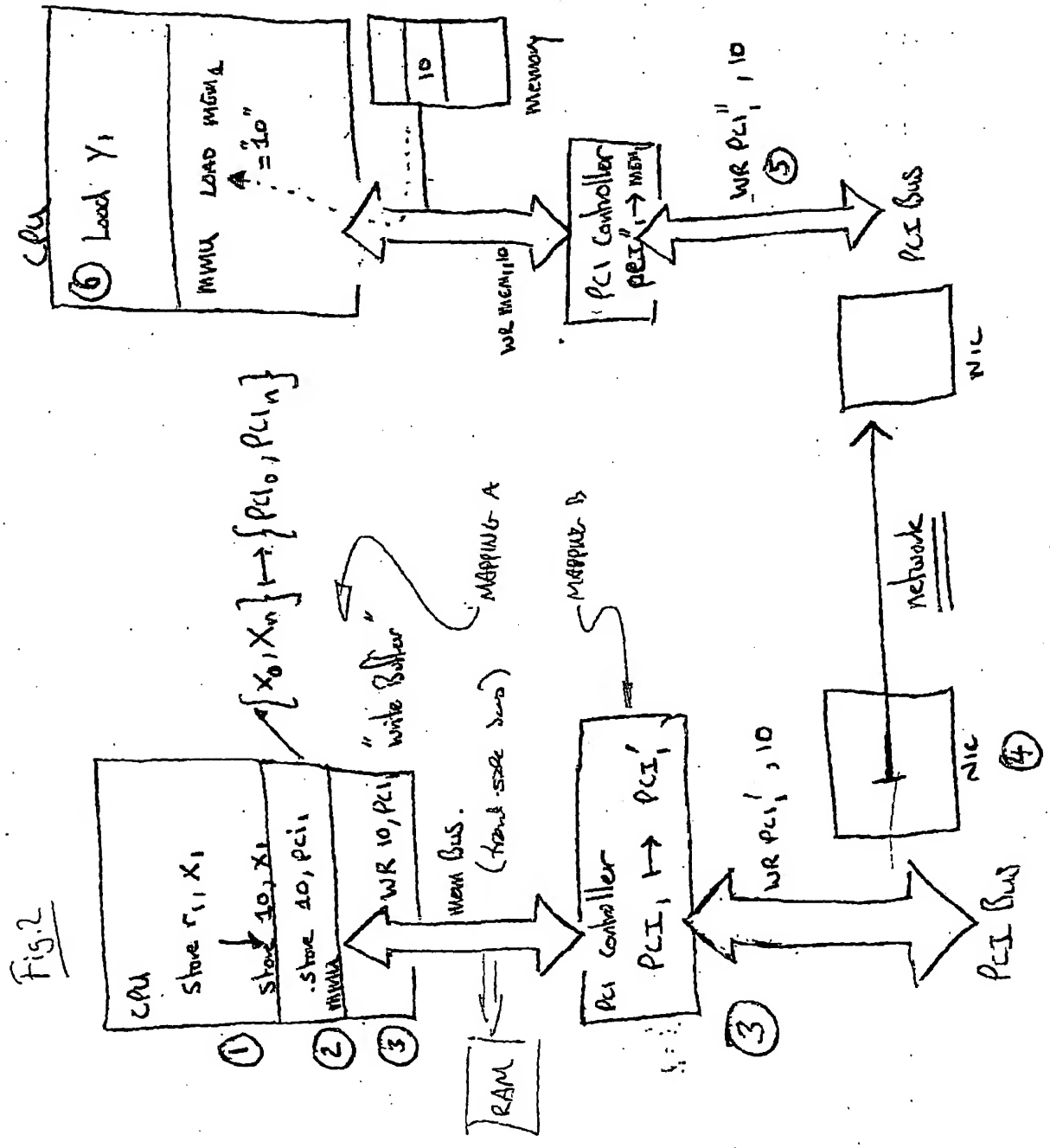
CPU
Store r1, X1
store 10, X1
store 10, pci1
MMIO
WR 10, pci1
"write Buffer"
MEM Bus.
(Host-side bus)
RAM
PCI Controller
PCI1 → PCI'1
WR pci'1, 10
PCI Bus
NIC
network
NIC
PCI Bus
WR pci''1, 10
PCI Controller
pci''1 → MEM
WR MEM110
MEMORY
10
CPU
Load Y1
MMIO LOAD MEM A
A = "10"
{X0, Xn} → {pci0, pcin}
MAPPING A
MAPPING B
Fig.2
1
2
3
3
4
5
6

Fig 3

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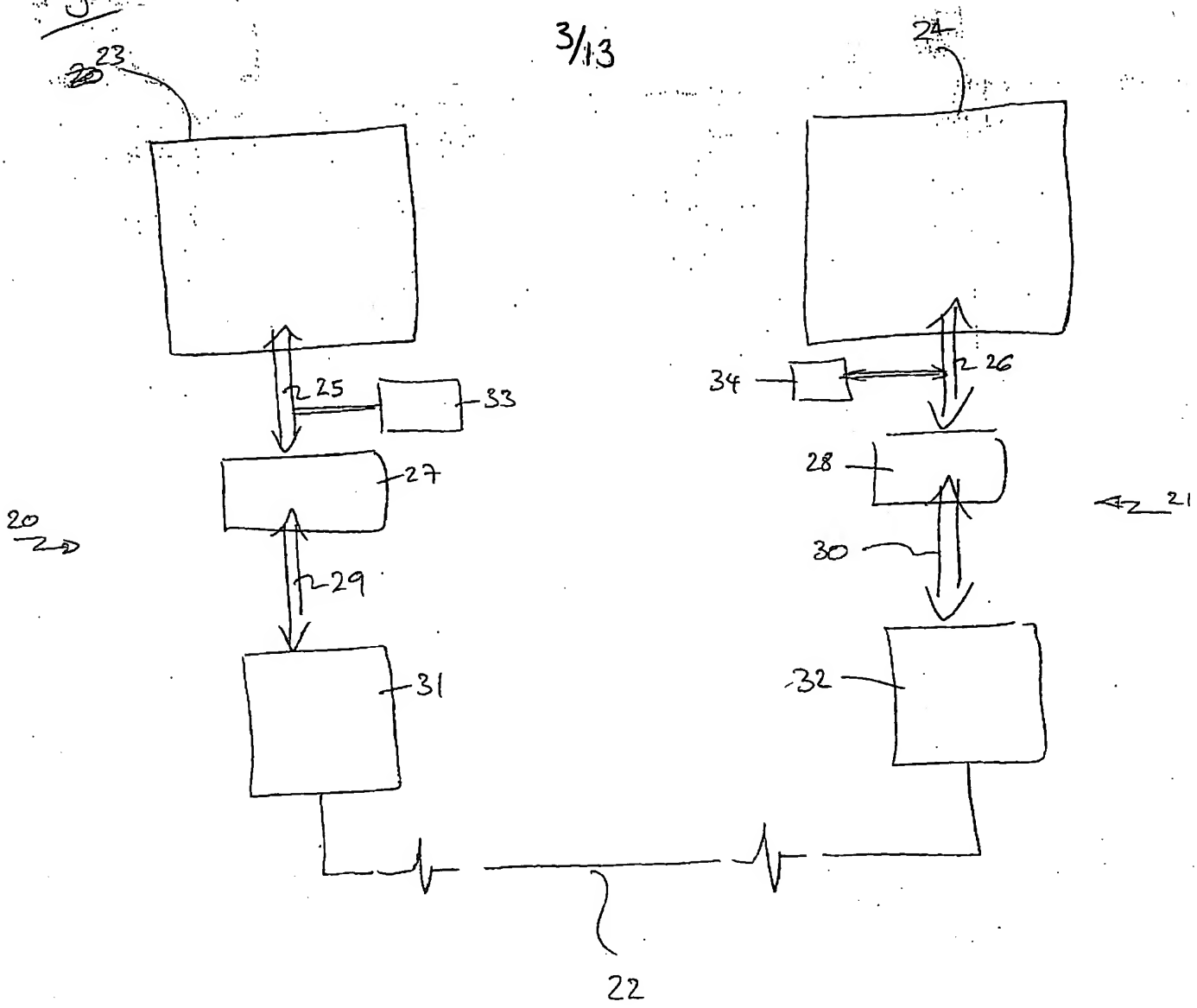

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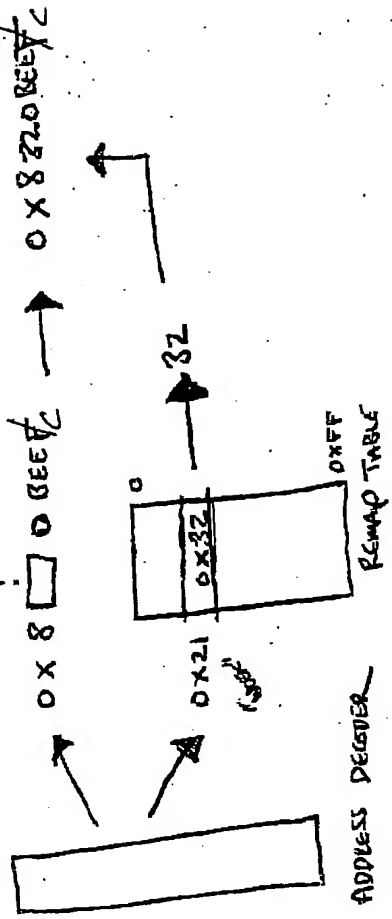
0X8 2210 BEEFC
?
0X8 BEEFC
32
0X32
0X21
0XFF
FORWARD TABLE
ADDRESS DECODER
PCI BUS

Fig 4

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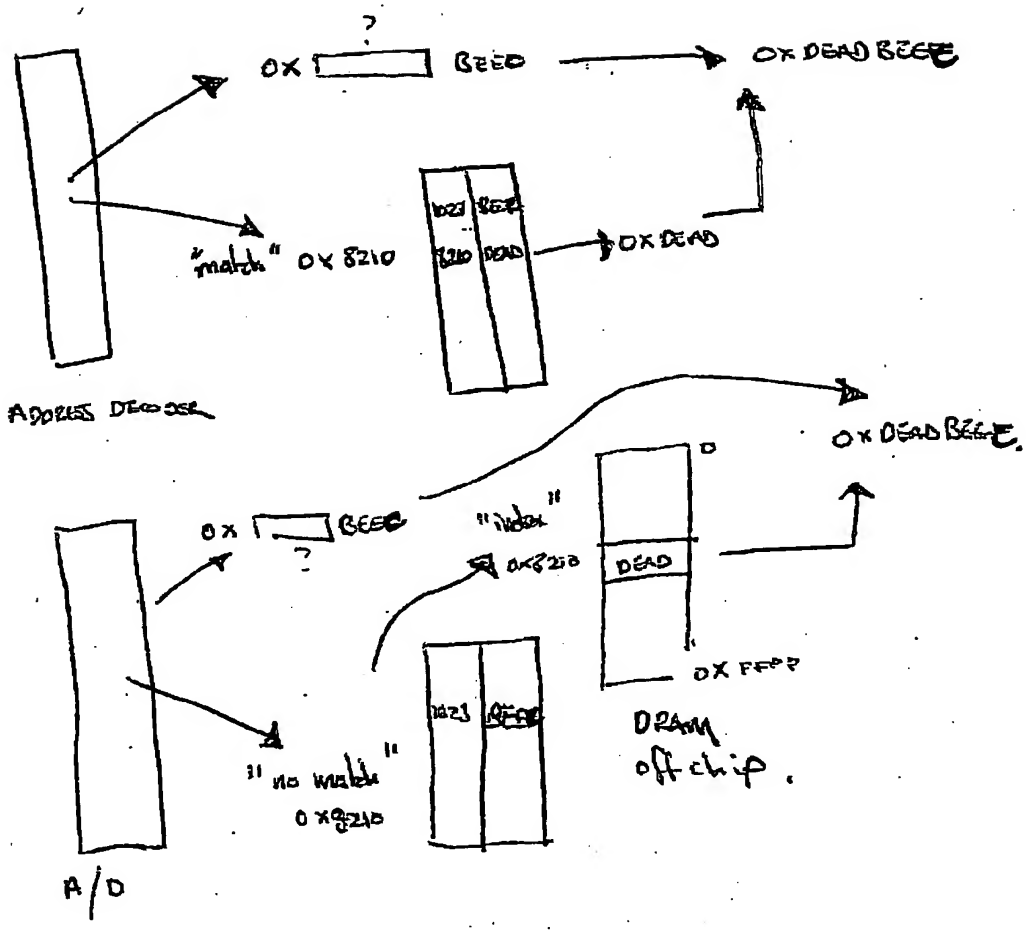
Fig. 5

Either

0x 8210 BEEF

PCI Bus



or

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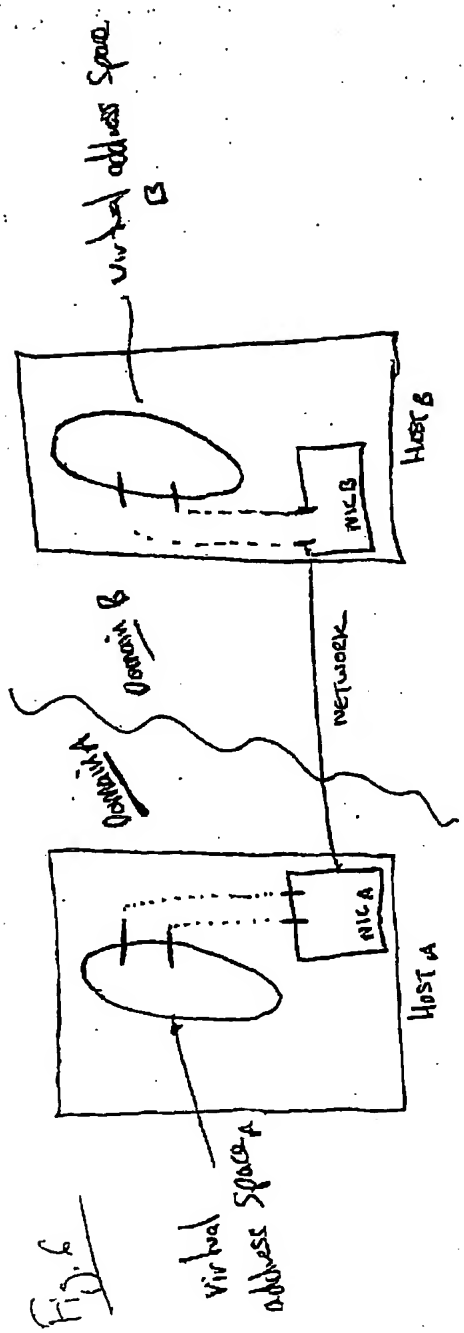
Virtual address Space B
HOST B
NIC B
Domain B
Domain A
NETWORK
NIC A
HOST A
Virtual address Space A

Fig. 6

Fig. 7

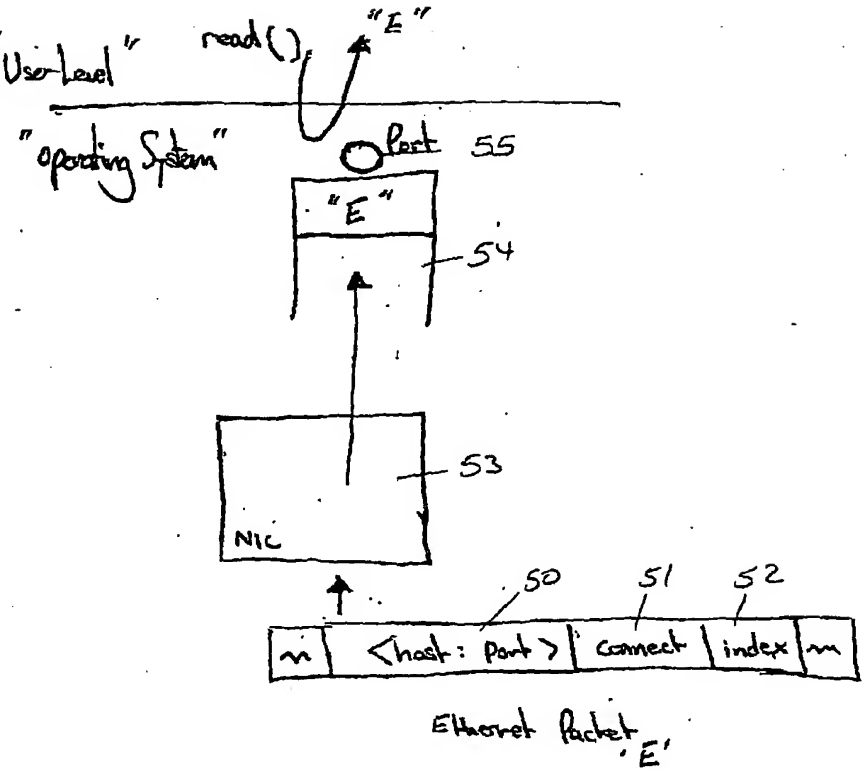
"User Level"
read()
"E"
"operating System"
Port
55
"E"
54
53
NIC
50
51
52
n
<host: port>
connect
index
m
Ethernet Packet 'E'

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Fig. 8

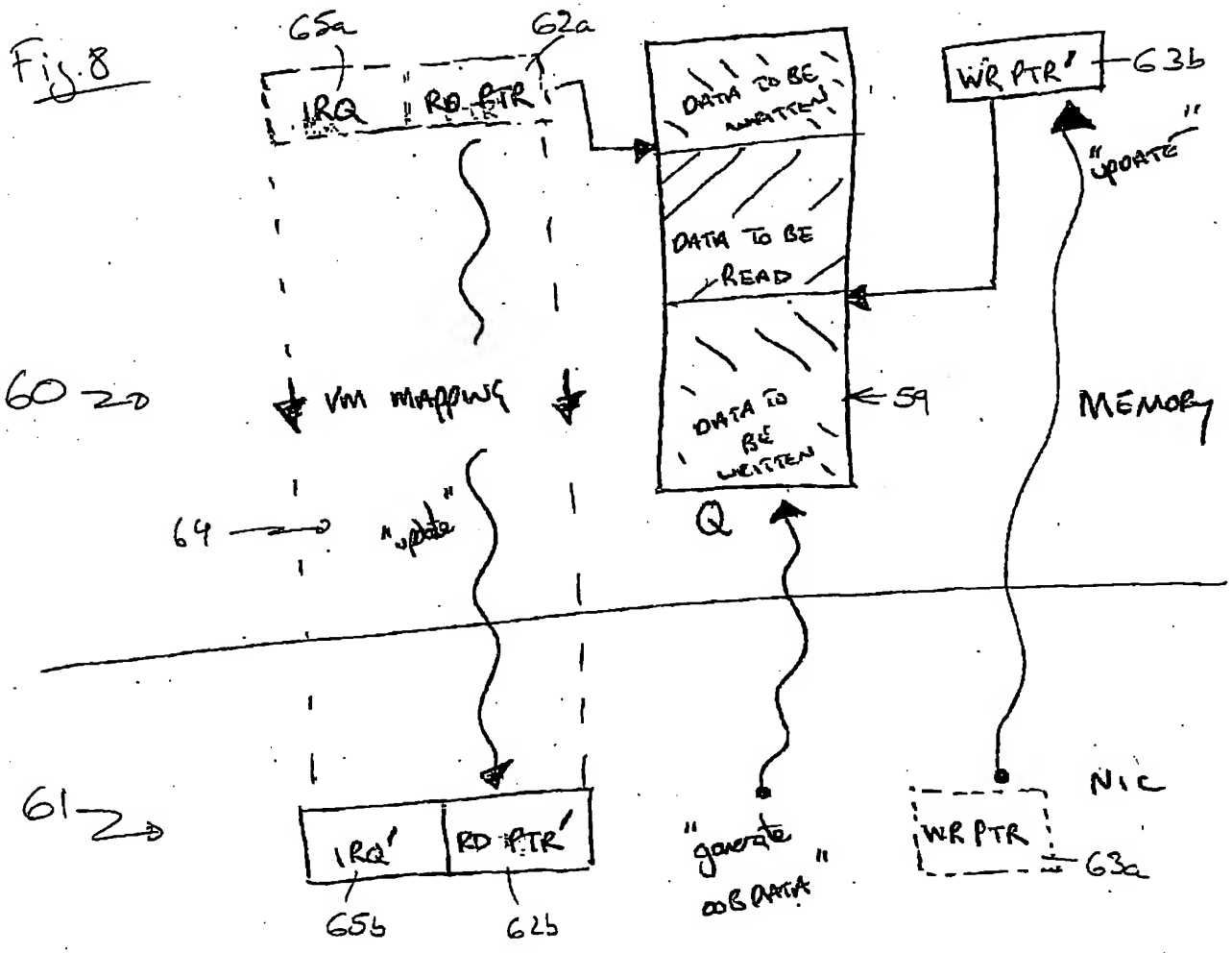
65a
62a
IRQ
RD PTR
DATA TO BE WRITTEN
DATA TO BE READ
DATA TO BE WRITTEN
59
WR PTR'
63b
"update"
60
VM MAPPING
MEMORY
64
"update"
Q
61
IRQ'
RD PTR'
65b
62b
"generate OB DATA"
NIC
WR PTR
63a

Fig 9

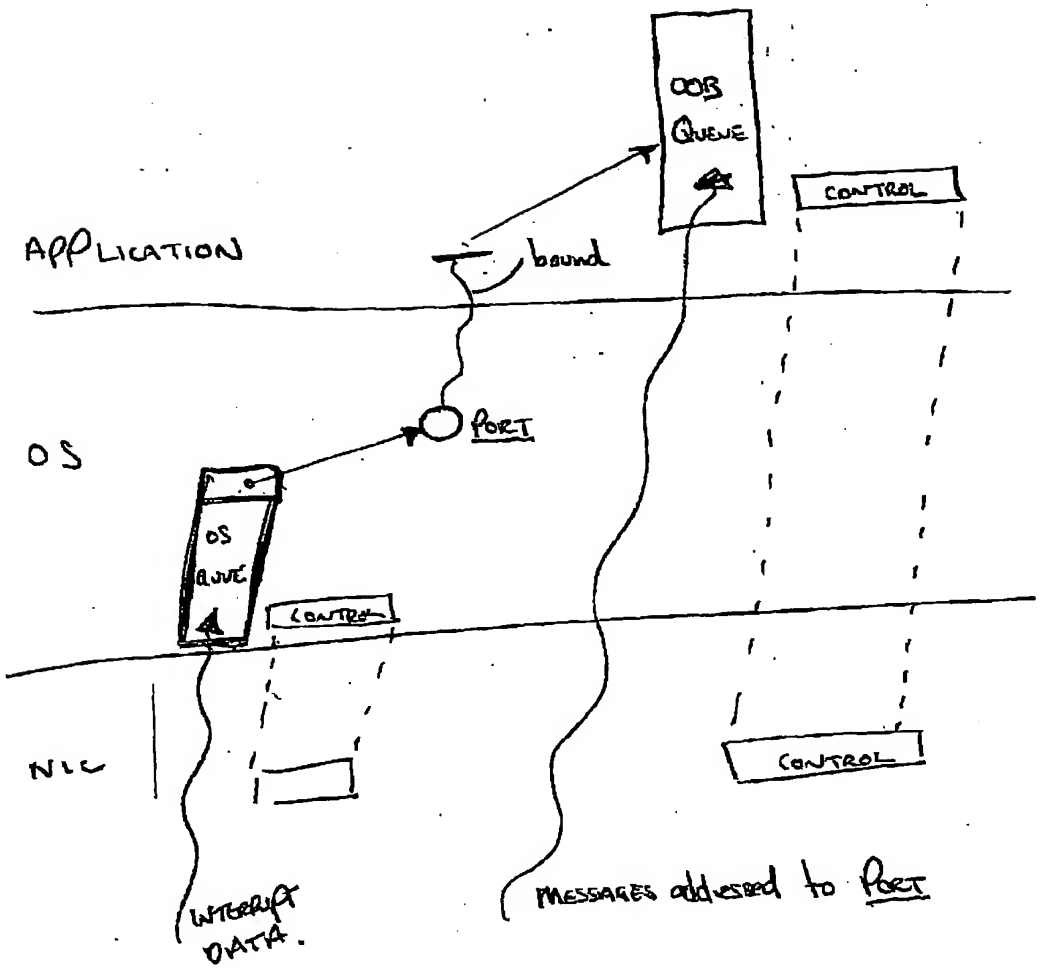
OOB
QUEUE
CONTROL
APPLICATION
bound
PORT
OS
OS
QUE
CONTROL
NIC
CONTROL
INTERRUPT
DATA.
MESSAGES addressed to PORT

Fig. 10

[NB order here not relevant]

			TYPE CI EVENT	PORT		SEQ number
BASE of PCI ADDRESS	48 BYTE DEST ETHERNET ADDRESS	16 bit DEST CLUSTER ADDRESS	TYPE CI	nonce	aperture index	SEQ number
"	"	4 byte DEST IP ADDRESS	TYPE IP	PORT		"

PCI → Ethernet Packet

OUTGOING APERTURES

Fig. 11

incoming apertures

aperture index	nonce	SEQ number	TYPE CI	Source cluster ADDRESS	Source Ethernet address	SIZE	Base of PCI address for aperture
PORT		SEQ number	TYPE CI Event	Source IP address	Source Ethernet address		Pointer to descriptor for Event queue
"		"	TYPE IP	"	"		Pointer to descriptor variable data queue

Ethernet Packet → PCI

Fig. 12

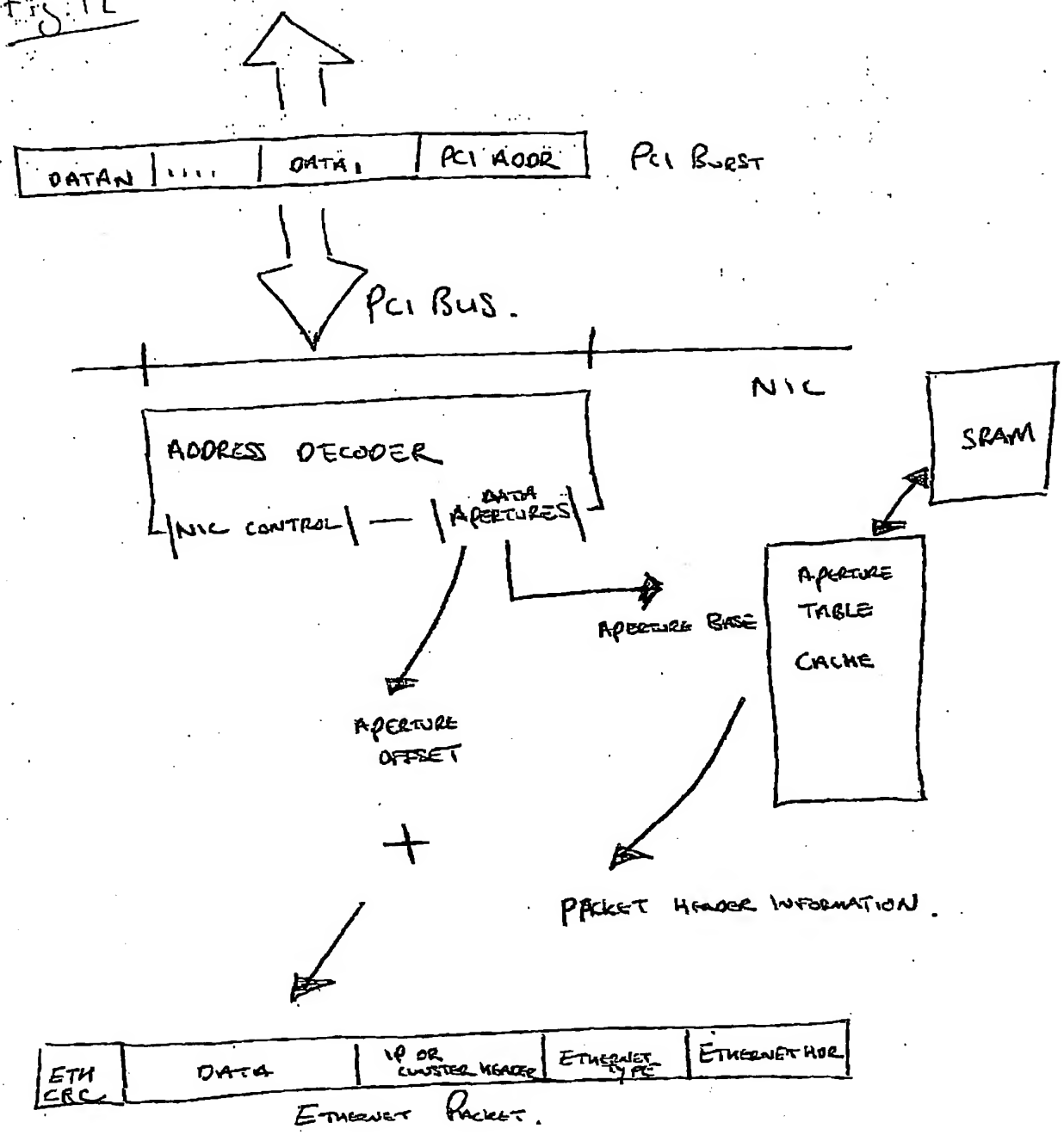
DATAN
....
DATA1
PCI ADDR
PCI BURST
PCI BUS.
NIC
ADDRESS DECODER
NIC CONTROL
DATA APERTURES
SRAM
APERTURE TABLE CACHE
APERTURE BASE
APERTURE OFFSET
+
PACKET HEADER INFORMATION.
ETH CRC
DATA
IP OR CLUSTER HEADER
ETHERNET TYPE
ETHERNET HDR
ETHERNET PACKET.

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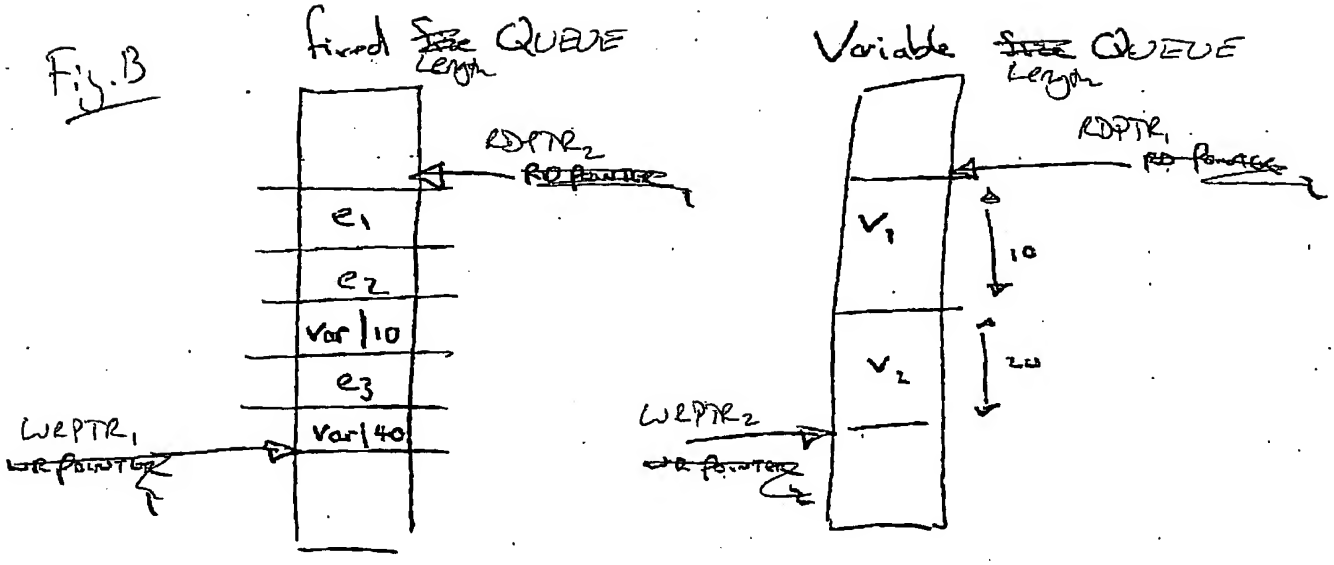
Fig. B


fixed ~~Size~~ Length QUEUE
RDPTR2
RD POINTER
e1
e2
Var | 10
e3
Var | 40
WRPTR1
WR POINTER
Variable ~~Size~~ Length QUEUE
RDPTR1
RD POINTER
V1
10
V2
20
WRPTR2
WR POINTER